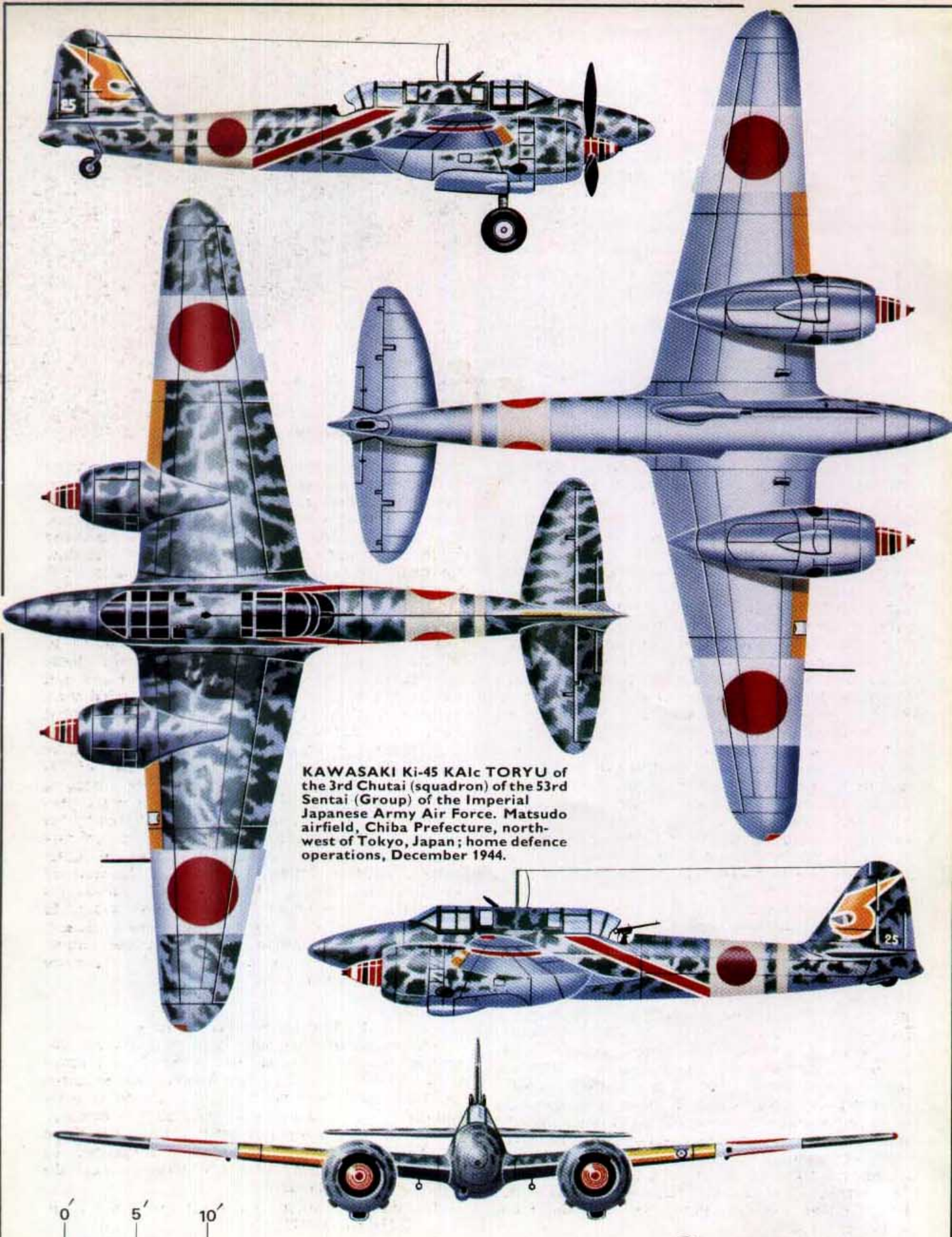
PROFILE
PUBLICATIONS

The Kawasaki Ki-45 Toryu

NUMBER 105
TWO SHILLINGS



KAWASAKI Ki-45 KAIc TORYU of the 3rd Chutai (squadron) of the 53rd Sentai (Group) of the Imperial Japanese Army Air Force. Matsudo airfield, Chiba Prefecture, north-west of Tokyo, Japan; home defence operations, December 1944.

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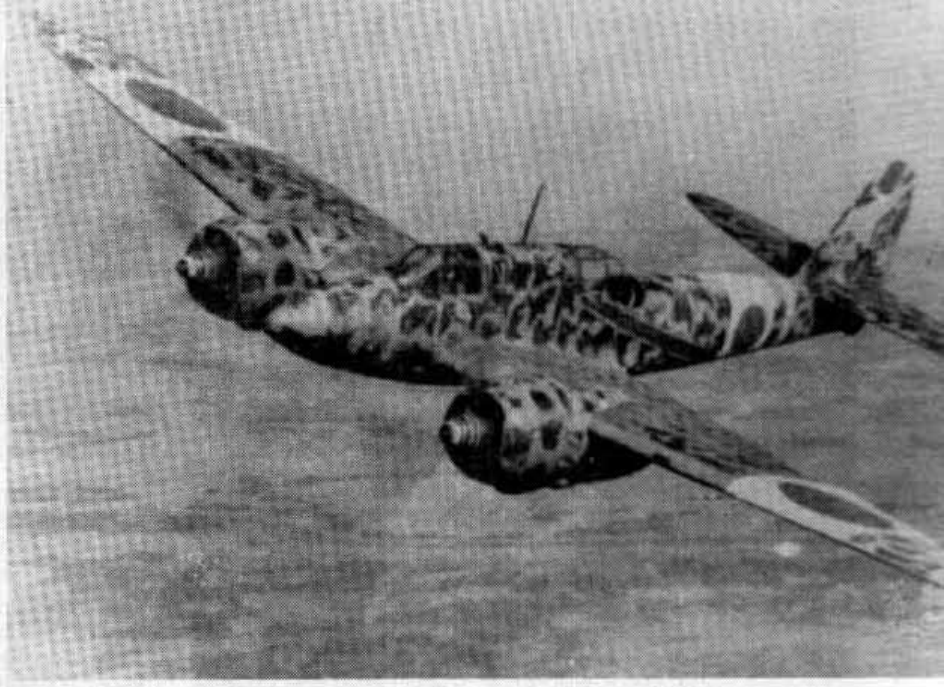


A Ki-45 of the 53rd Sentai in flight over Japan in 1945; the white background of the national markings indicates an aircraft of a Home Defence unit. (Unless otherwise stated, all the photographs appearing in this Profile *are from the author's collection)*

The Kawasaki Ki-45 Toryu

by René J. Francillon Ph.D.

By the mid-thirties, unnoticed to foreign observers and military attaches, Japanese aircraft designers had attained parity with their Western counterparts and such original designs as the Navy Type 96 Attack Bomber (Mitsubishi G3M, Nell), Navy Type 96 Carrier Fighter (Mitsubishi A5M, Claude), Navy Type 97 Carrier Attack Bomber (Nakajima B5N, Kate), Army Type 97 Fighter (Nakajima Ki-27, Nate) and Army Type 97 Heavy Bomber (Mitsubishi Ki-21, Sally) brought Japan amongst the leading countries in aviation development. Whilst Japanese aircraft manufacturers progressed from the production of licence-built foreign types and of aircraft designed in Japan by foreign engineers to the production of original aeroplanes, they kept a close watch on current developments in the Western Hemisphere. Endeavouring to support the domestic aircraft industry in obtaining useful competitive data and to provide a yardstick by which to measure the effectiveness of Japanese aircraft, the Imperial Japanese Navy and Army kept importing the most modern aircraft they could obtain either by direct purchase or through the intermediary of trading companies and airlines (Japan Air Transport Co., International Air Lines Co., and Manchurian Air Lines Co.).

One development which did not escape the attention of both the Japanese military staff and the Japanese aircraft manufacturers was the sudden enthusiasm for twin-engined long-range fighters generated by specifications simultaneously issued in France and Germany in late 1934. Faced with long overwater flights in the eventuality of war operations in the Southwest Pacific and with the immensity of Southeast Asia, the Japanese Air Forces were naturally inclined to view with more than a passing interest the appearance of new aircraft types potentially capable of solving the range deficiency of the contemporary single-engine fighters. However, some thirty months passed without any concrete action and, in March 1937, when the Imperial Japanese Army issued its specifications for a twin-engined long-range fighter, the French, German and Dutch were already test flying similar aircraft (Potez 630, Messerschmitt Bf 110 and Fokker G.I).

Unable to agree on the relative importance to be given to speed, manoeuvrability and armament in the design of a twin-engined heavy fighter, the Army Aeronautical Research Institute at Tachikawa (Rikugun Kokugijutsu Kenkyujo) prepared remarkably simple specifications devoid of stringent requirements, thus easing the manufacturers' task whilst reserving for itself the possibility of influencing at a later date the final design of the aircraft. In March 1937 Kawasaki Kokuki K. K. (Kawasaki Aircraft Co., Ltd.), Mitsubishi Jukogyo K. K. (Mitsubishi Heavy Industries Co., Ltd.) and Nakajima Hikoki K. K. (Nakajima Aircraft Co., Ltd.) were instructed to initiate design studies in compliance with these specifications. However, the Mitsubishi Ki-39 and the Nakajima Ki-37 designs were discontinued early in the programme owing to a shortage of experienced design personnel in these two companies. The initial Kawasaki Ki-38 proposal, the work of a team led by Isamu Imashi, called for the use of a pair of 12-cylinder liquid-cooled engines mounted on a wing of elliptical planform. Preliminary design work progressed rapidly during the summer of 1937 but by the following October, just as Kawasaki was completing a detailed mock-up, the Imperial Japanese Army decided to cancel further development. This decision was not reflecting any disapproval on Kawasaki's effort but had been dictated by the necessity to smooth away the dissension existing amongst J.A.A.F. officers as to the relative merits of various performances of the proposed aircraft and to prepare detailed specifications.

EARLY CONFIGURATION

In the middle of December 1937 an agreement was reached between members of the Air Headquarters (Koku Hombu) and the Army Aeronautical Research Institute and a new specification calling for a twin-engined two-seat fighter was presented to Kawasaki. This manufacturer was instructed to initiate work on the Ki-45, as the new project was designated, by updating and revising its Ki-38 data to meet the following requirements:

(1) Maximum speed: 540 km/h. (335·5 m.p.h.) at 3,500 m. (11,480 ft.);

(2) Operating altitude: 2,000 m. (6,560 ft.) to 5,000 m. (16,405 ft.);

The first prototype Ki-45 at Gifu in the spring of 1939. The absence of fuselage Hinomaru *and the diogonal red stripe are noteworthy.*

(3) Endurance: Four hours and forty minutes at 350 km/h. (217 m.p.h.) plus thirty minutes at combat rating;
(4) Engines: Two 9-cylinder radials Nakajima Ha-20b;
(5) Armament: Two forward firing guns and one flexible rear firing machine gun.

Immediately after the New Year work started in earnest at Kawasaki's Gifu plant under the leadership of Takeo Doi, who had replaced Isamu Imashi as chief project engineer, and his deputy Tsuyoshi Nemoto. The task facing Takeo Doi was overwhelming as Kawasaki had no previous experience with high performance twin-engined aircraft with retractable landing gear. The fastest aeroplane yet built by this company, the Army Experimental Fighter Ki-28 (301 m.p.h. at 11,480 ft.), was then undergoing competitive test against the Nakajima Ki-27 and the Mitsubishi Ki-33 for the selection of a replacement of the standard J.A.A.F. fighter, the Army Type 95 Fighter (Kawasaki Ki-10, Perry), a single-engined biplane with fixed undercarriage. It is thus quite remarkable to note that the detailed engineering design was completed in October 1938, a mere ten months after receipt of the contract.

In early January 1939 the first Army Experimental Ki-45 Two-seat Fighter (c/n 4501) was rolled out at the Gifu plant and, following a brief period of ground tests, underwent protracted flight trials. This aircraft was powered by a pair of experimental 9-cylinder radial Nakajima Ha-20b, a licence-built Bristol "Mercury", rated at 820 h.p. at 3,900 m. (12,795 ft.) and 790 h.p. for take-off. These engines were enclosed under large cowlings with a typical Bristol exhaust collector ring in front of the engine and drove 3-blade variable pitch propellers without spinners. The main undercarriage retracted manually to the rear of the engine nacelles, the shock struts being covered by two panels hinged to the side of the nacelles whilst the wheels protruded slightly outside to provide some protection in the event of wheel-up landing. The pilot, sitting over the wing leading edge, and the radio-operator/gunner, sitting over the trailing edge, were separated by the main fuel tank and were protected by sideway hingeing canopies. The forward firing armament, aimed by the pilot by means of a telescopic gunsight protruding through the windshield, consisted of two 7·7 mm. Type 89 machine guns mounted in the upper fuselage nose and one 20 mm. Ho-3 cannon, a modified Japanese Infantry 20 mm. Type 97 Anti-tank Rifle, mounted in a ventral tunnel on the starboard underside of the fuselage. The radio-operator manned a rear-firing flexible 7.7 mm. Type 89 machine gun. Soon troubles appeared as the aircraft suffered from its accelerated development and the lack of experience in high performance flight of its manufacturer. The main undercarriage, which retracted manually by chain and sprocket, was a source of constant difficulties whilst the rear gun mounting had to be redesigned as the original mounting was virtually useless at high speed. However, the main source of worries were the engines. Not only did Nakajima fail to overcome the initial teething troubles and to produce an engine delivering the specified power but Kawasaki's own inexperience with air-cooled engines had resulted in the adoption of excessively large nacelles generating too much drag and rendering routine maintenance extremely difficult.

With the appearance of the second prototype (c/n 4502) with minor equipment changes the engine nacelles were redesigned and large propeller spinners were adopted to reduce drag. As these modifications

The Ha-20b—powered first prototype; the gunsight can be seen protruding from the windshield.

Second prototype, with closer-fitting cowlings and spinners added. The exhaust collector ring around the cowling leading edge characterises Ha-20b-powered aircraft.

still failed to give satisfaction a ducted spinner fairing neatly with the cowling was selected for the third prototype (c/n 4503) completed in May 1939. Cooling air was forced through the centre of the ducted spinners and exhausted through slots in the wings ahead of the aileron/flap lines. In addition c/n 4503 was fitted with an electrically operated undercarriage retraction mechanism. The undercarriage problem was thus solved but flight trials were still disappointing due to nacelle stall and engine drag.

By the end of 1939 the maximum speed attained by the three Ki-45 prototypes was 480 km/h. (298 m.p.h.) at 4,000 m. (13,125 ft.). At that time six additional prototypes were in various stages of manufacturing: c/n 4504 through 4506 had already been fitted with a pair of Nakajima Ha-20b whilst c/n 4507 through 4509 were yet without powerplant. To eradicate the nacelle stall Kawasaki suggested the use of opposite-rotating airscrews to replace the right-hand rotating airscrews fitted to the first three prototypes. Although this modification appeared promising at the time as regards the stall problem the aircraft would still have been underpowered and unable to meet the speed requirement. Consequently this modification was not realized and flight trials were curtailed pending review of the project by the J.A.A.F.

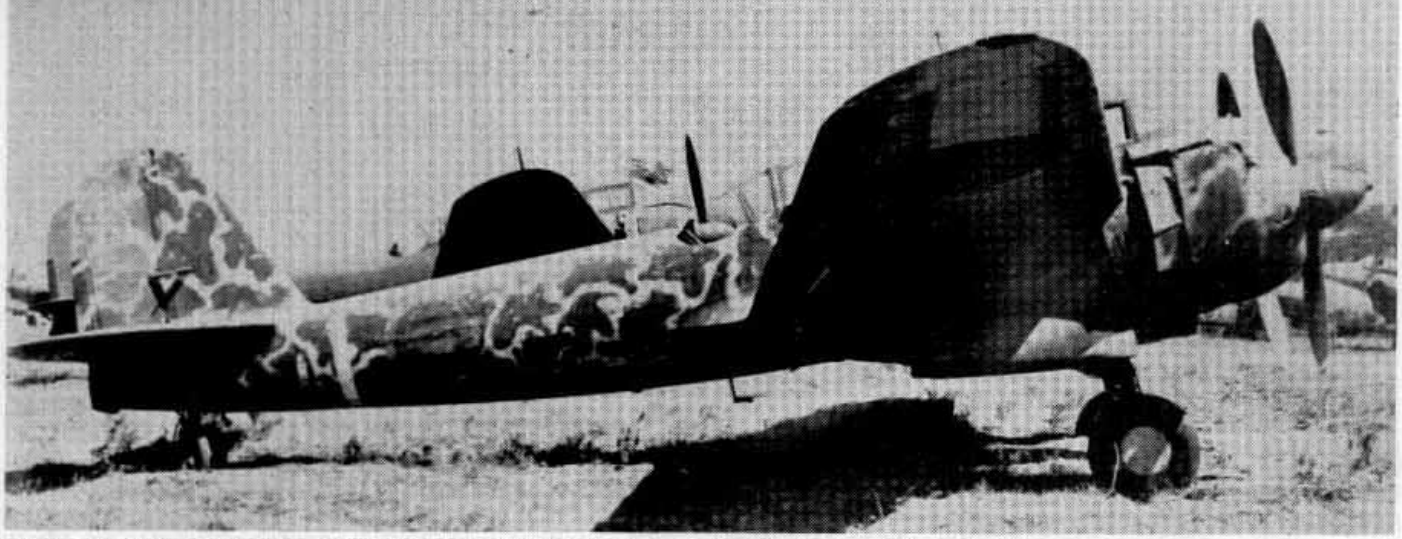
IMPROVED PROTOTYPES

In April 1940 the Koku Hombu (Air Headquarters) of the Imperial Japanese Army instructed Kawasaki to install a pair of 14-cylinder radial Nakajima Ha-25 on one of the uncompleted airframes. Not only was the Ha-25 more powerful (1,050 h.p. at 8,340 ft. and 970 h.p. at take-off) than the Ha-20b but it had a smaller diameter. Kawasaki, which had cause to fear the cancellation of the project, gladly accepted and mounted the new engines in N.A.C.A.-type cowlings with small spinners on the seventh airframe (c/n 4507). The intake for the single-stage supercharger was mounted on the wing leading edge outboard of the engine nacelles and the oil cooler intake was located under the cowling. The main undercarriage was electrically operated and the wheels were now entirely enclosed within the engine nacelles. In all other respects the new aircraft was identical to the first three prototypes and it was known as the Experimental Improved Type 1 Ki-45. Unfortunately for its manufacturer the aircraft was still bedeviled by bad luck and on its first take-off, in July 1940, a cowling flap was torn away forcing the pilot to make an emergency landing in which damage to the undercarriage, the propellers and a wingtip was incurred. A month later the aircraft was repaired and was soon joined by seven additional test aircraft including the re-engined fourth, fifth, sixth, eighth and ninth prototypes (c/n 4504, 4505, 4506, 4508 and 4509). By then the undercarriage was reliable, the nacelle stall and drag had been eradicated, and the Experimental Improved Type 1 Ki-45 almost met the speed requirement when one of these aircraft was clocked at 520 km/h (323 m.p.h.) at 3,500 m. (11,480 ft.).

Ki-45 Kaizo (Modified)

Whilst flight trials of the Experimental Improved Type 1 Ki-45 was getting underway, Takeo Doi and his team initiated a complete redesign of the aircraft to correct the last deficiencies, to improve the performances and to simplify quantity production. Kawasaki suggested that the elliptical wing used on the 11 prototypes be replaced by straight tapered surfaces increasing span by 0·5 m. (1,640 ft.) and

An improved Type 1 Ki-45 prototype with Ha-25 powerplants. Note the supercharger intake on the wing leading edge just outboard of the nacelles.



This early production Toryu, *an Ha-25-powered Ki-45 KAIa, was found in Japan at the end of the war.*

wing area by 3 sq. meters (32·3 sq. ft.) and that the Ha-25 engines be mounted lower on the wing in nacelles of smaller diameter incorporating the supercharger intake in the upper lip. The tail surfaces were also redesigned whilst a slimmer fuselage with straight contours was adopted. Recommended equipment changes included the use of a reflector-type gunsight, the replacement of the 7·7 mm. Type 89 rear-firing flexible gun by a 7·92 mm. Type 98 (Japanese version of the German MG 15) and the use of a pair of 12·7 mm. Type 1 machine guns in the nose in lieu of the previous 7·7 mm. Type 89. Two months later, in October 1940, the Imperial Japanese Army agreed to these changes and detailed design was completed by Kawasaki in May 1941.

The first prototype of the redesigned aircraft, designated Ki-45 KAI (KAI being the abbreviation for Kaizo or modified), was rolled out at the Gifu plant in August 1941 and entered flight trials the following month. By the end of 1941, two additional prototypes and twelve preproduction aircraft had been manufactured and the flight trial results finally gave complete satisfaction, the Imperial Japanese Army adopting the aircraft as the Army Type 2 Model A Two-seat Fighter *Toryu* (Dragon Killer) (Kitai designation: Ki-45 KAIa) and instructing Kawasaki to manufacture the aircraft in its new Akashi plant as well as in its main Gifu plant.

INTO SERVICE

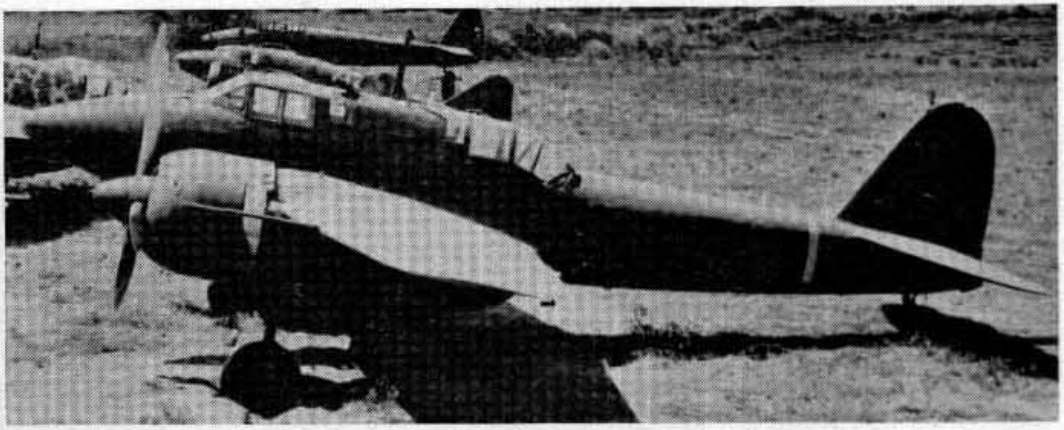
In early August 1942, following completion of the Army flight test programme, *Toryus* were delivered to the 5th Sentai (Group) which, initially, operated as a Conversion Unit prior to its deployment to New Guinea in July of the following year. However, the first operational units were the 21st Sentai, which took its Ki-45 KAIa to Burma in October 1942, and the 16th Sentai, which arrived a month later on the Chinese mainland. Entering service at a time when the Japanese air forces had wrested the control of the skies from the Allied air forces the *Toryus* were often used for anti-shipping and ground attack duties in which they met with considerable success. However, like its German counterpart, the Bf 110, the *Toryus* proved to be of limited value when operated as a long-range fighter, the mission for which both aircraft had been designed. Although quite manoeuverable for a twin-engined fighter this aircraft was outclassed when pitted against Allied single-engined fighters and its slow-firing 20 mm. cannon proved of little value in air-to-air combat. However, when opposing P-38s at medium altitude the *Toryus* easily outmanoeuvred the American aircraft which suffered even more of the inherent lack of manoeuvrability of twin-engined fighter aircraft. Another feature of the aircraft which won popularity was the fuel tank protection, an unknown luxury in contemporary Japanese aircraft.

Whilst *Toryus* were blooded in Southeast Asia the production gained tempo and the Akashi plant, in Hyogo Prefecture, 50 miles west of Osaka, delivered its first Ki-45 KAIa in December 1942. In September 1942 one *Toryu* had been assembled at Akashi from components built in the Gifu plant. Six months after the roll-out of the first *Toryu* at Akashi the production of this plant surpassed that of Kawasaki's main plant and in September 1943 the Gifu plant ceased manufacturing Ki-45 KAIs.

Just as the Ki-45 KAIa entered service Kawasaki initiated design of a more powerful version, the Ki-45-II with two 1,500 h.p. Mitsubishi Ha-112-II. However, in December 1942, the Japanese Army Air Headquarters instructed Kawasaki to complete the aircraft as a single-seater, the project being renumbered Ki-96. This aircraft and its derivative, the Ki-102 and Ki-108, represented a major redesign and as such will be dealt with in a future *Profile*.

To improve the *Toryu's* effectiveness as an anti-shipping and ground attack aircraft a specialized model, the Ki-45 KAIb, was produced in the Gifu and Akashi plants. Initially the Army Type 2 Model B Two-seat fighter differed from the Model A solely by the replacement of the two 12·7 mm. Type 1 machine guns by a single 20 mm. Ho-3 cannon mounted centrally in the nose of the installation of a hand-loaded 37 mm. Type 98 cannon in the ventral tunnel. However, later production aircraft were powered by

Ki-45 KAIa photographed at Clark Field in the Philippines in 1945. Note the hole left in the lower nose by the removal of the landing light.



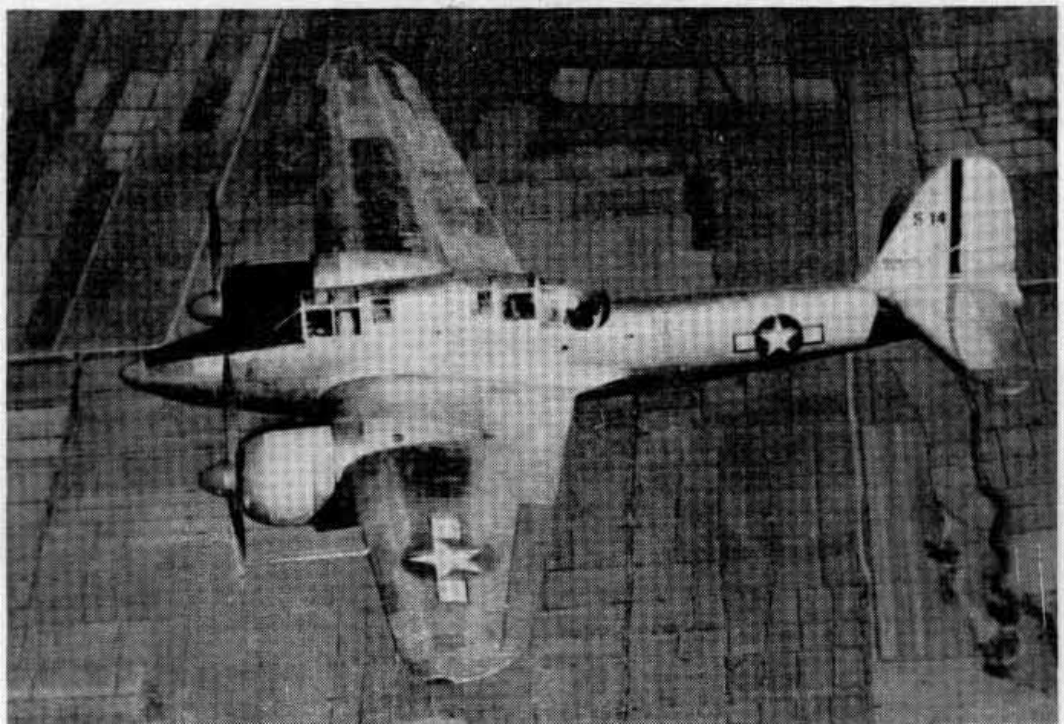
A captured Ki-45 KAIc parked with another Ki-45 KAI, a Ki-46-II and a J5N1 in the background. Note the crudely-painted "U.S." ahead of the fuselage Hinomaru.

a pair of 14-cylinder radial Army Type 101 (Mitsubishi Ha-102) developing 1,080 h.p. at 2,700 r.p.m. on take-off, 1,050 h.p. at 9,185 and 950 h.p. at 19,025 ft. These engines were enclosed in slightly smaller but longer nacelles than those used on the earlier Ha-25 powered aircraft. Performances were unchanged as the increased power was offset by an increase in all-up weight but the improved reliability of the Ha-102 was appreciated by flight and ground crews alike.

As the *Toryu's* production was stepped up the Ki-45 KAI became a frequent sight over much of Southeast Asia and the Dutch East Indies. Assigned the code-name Nick, the aircraft had first been mistaken for a Japanese version of either the French Potez 63 or the German Messerschmitt Bf 110. Later on reports from China identified the aircraft as a Japanese design believed to be designated I-45 and the first clear photographs of the Toryu were obtained in the autumn of 1943 during a raid on Boran airfield, New Guinea, by North American B-25s of the U.S. 5th Air Force. In combat Ki-45 KAIs were giving a good account of themselves, proving particularly effective against the U.S. Navy P.T. boats and Allied armoured vehicles. They also inflicted heavy losses on the B-24s which often operated long-range missions without the benefit of fighter escort, thus forcing General Kenney to increase his pressure on the U.S.A.A.F. Headquarters to obtain more P-38s, the only Allied fighter aircraft then having sufficient range to escort the B-24s in their long penetration missions. Night operations by B-24s were also stepped up placing a new strain on the Japanese air forces which were not equipped with specialized night fighter units.

To combat this new threat a few Ki-45 KAIa were modified in the field to serve as night fighters. No airborne radar equipment was available and the aircraft had to rely on ground guidance and pilot's ability to intercept Allied bombers. Once the bombers were located the Japanese pilots turned on their landing lights, located in the lower nose of the Ki-45 KAIa, to illuminate their adversaries. The night fighter version of these early *Toryus* had their armament increased by the installation of two 12·7 mm. Type 1 machine guns firing obliquely forward, these guns replacing the main fuselage fuel tank placed between the pilot and the radio-operator/gunner.

In early 1944 the Japanese High Command was aware of the impending attack on the homeland by Boeing B-29s and it was feared that night operations would be selected by the U.S.A.A.F. As the development of new aircraft types for night fighting was going to take several months and as the operation in New Guinea and Rabaul by modified Ki-45 KAIa had proven fairly successful the Air Headquarters instructed Kawasaki to initiate production of a night fighter version of the *Toryu*. Airborne radar being still under development in Japan, Takeo Doi decided to use a Ki-45 KAIb as the basis for a night-fighter, modifications being limited to the relocation of some instruments and the adoption of a revised armament. The nose of this version, the Army Type 2 Model C Two-seat Fighter or Ki-45 KAIc, was slightly longer and more pointed and all armament was eliminated from it. The ventral 37 mm. cannon was retained but was now a semi-automatic Ho-203 with 16 rounds and two 20 mm. Ho-5 cannons were mounted in the centre fuselage to fire obliquely forward. Initially the 7·92 mm. flexible machine gun was retained. The Ki-45 KAIc was placed in production at the Akashi plant in March 1944, the first aircraft being completed the following month.



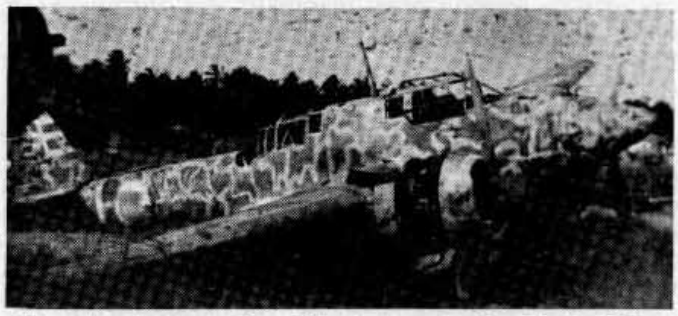
In-flight view of an unarmed Toryu *undergoing flight evaluation by the Technical Air Intelligence Unit—Southwest Pacific Area.*
(Photo: U.S.A.F.)

Close-up of an early Ki-45 KAIc showing clearly the obliquely-mounted Ho-5 fuselage cannons.

THE Ki-45 KAIc DESCRIBED

The Kawasaki Ki-45 KAIc *Toryu* (Dragon Killer) was a twin-engined, two-seat, low-wing cantilever monoplane of conventional design.

Fuselage: All metal semi-monocoque structure of oval section with a light alloy, flush riveted, stressed skin covering. The pilot was seated over the wing leading-edge and was protected by a 17 mm. head and back armour plate. The cockpit layout was fair but the width and height were small by comparison with contemporary Allied aircraft. Behind the pilot was mounted a fuselage fuel tank and the two obliquely firing 20 mm. Ho-5 cannons. Below the fuel tank and in a starboard ventral tunnel was mounted a 37 mm. Ho-203 cannon. A 13 mm. armour plate was provided ahead and behind the Ho-203 magazine. The radio-operator was seated in a separate cockpit facing to the rear and no emergency dual control was fitted. His canopy, like the one covering the pilot's cockpit, was of the hinged type, opening from the left, and without emergency release system. In combat, the radio-operator manned the flexible 7·92 mm. Type 98 machine gun which normally retracted in the rear fuselage upper decking. This gun could be elevated 80° or depressed 20° and had a maximum field of fire of 180°. No armour plate was provided for the radio-operator.

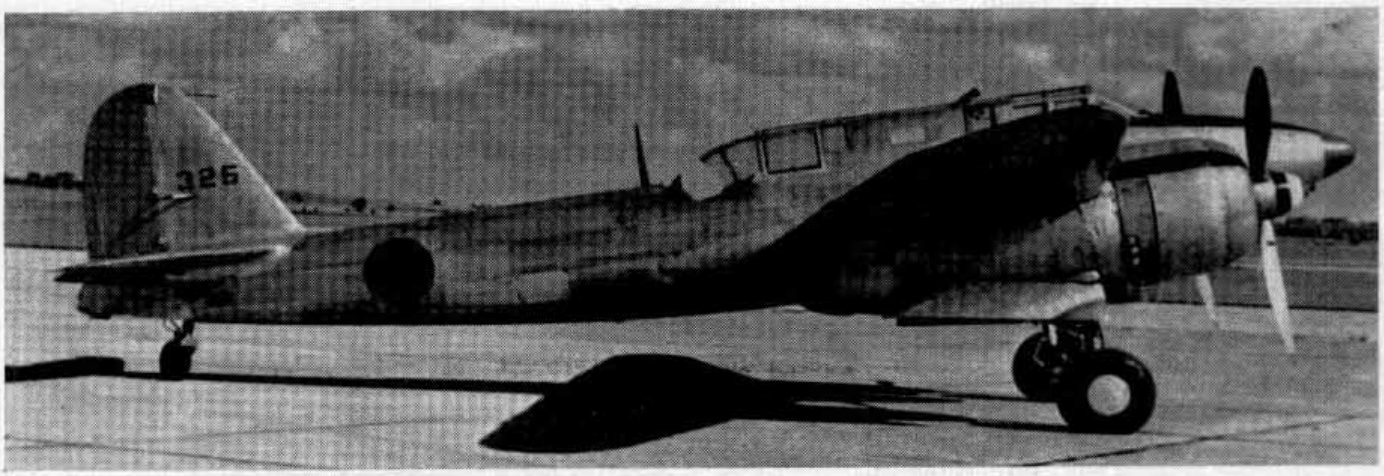


Although of poor quality, this photograph of a Ki-45 KAIc at Kallang airfield, Singapore, in August 1945 is noteworthy in that it illustrates a machine of the little-known 71st Dokuritsu Hiko Chutai; see colour illustration on p.11 of this Profile. (Photo: Frank D. Price)

Wings: All metal mid-wing cantilever of equal taper with rounded tips. The fabric covered ailerons were provided with trim tabs adjustable on the ground only. The wing flaps, push-pull torque tube system, were hinged at the leading-edge to the wing panel and extended from the aileron to the junction of fuselage to the wing. They were constructed from sheet metal and covered with metal on the lower surface only.

Tail: The rudder and horizontal tail surfaces were conventional, being of metal frame work covered with fabric. The elevator and rudder tabs could be

Army Type 2 Model A Two-seat Fighter—"The Dragon-Killer". In the background a Ki-46 of the 15th Sentai is just visible.



A captured Ki-45 KAIc in the United States. This machine, with natural metal finish, has been repainted in spurious Japanese markings.

adjusted in flight. The rudder had a shielded horn balance.

Undercarriage: Fully retractable hydraulically operated conventional landing gear. The main gear retracted backwards into the engine nacelles with hinged doors enclosing the wheels within the contours of nacelles. The tail wheel was also retractable but no door was provided to cover the wheel well.

Engines: Two 14-cylinder air-cooled Army Type 101 (Mitsubishi Ha-102) developing 1,080 h.p. at 2,700 r.p.m. on take-off, 1,050 h.p. at 2,600 r.p.m. and 9,185 ft., and 950 h.p. at 2,600 r.p.m. and 19,025 ft. Single-stage, two-speed integral supercharger manually controlled by a selector valve. Each engine drove a 9 ft. $8\frac{5}{32}$ in. three-blade, non-feathering propeller controlled by governors maintaining constant speed by regulating the flow of oil from the engine to the propeller hub.

Fuel System: Total internal capacity: 265 U.S. gallons in five tanks located as follows: one self-sealing fuselage tank behind the pilot, one unprotected tank in each inboard wing leading-edge and one self-sealing tank in each inboard wing behind the unprotected tank. Two 53 U.S. gallons drop-tanks could be carried under the wing centre-section. On the aircraft not fitted with oblique-firing cannons an additional fuselage fuel tank with a capacity of 120 U.S. gallons was mounted.

FLYING THE DRAGON KILLER

In tests conducted at the end of the war by pilots of the U.S. Air Materiel Command the *Toryu* was found to possess very poor taxying and general ground handling characteristics due to the extremely weak brakes and a full-swivel tail wheel. Due to the high nose attitude which impaired forward vision "S" turns were necessary and taxying was accomplished with the throttles in the idle position and by the use of brakes. The take-off characteristics were very good, the aircraft necessitating only a short roll and becoming airborne at 85-90 m.p.h. I.A.S. Initial climb was good and acceleration continued in the climb. The effectiveness of the control was satisfactory from high speed down to the stall with the exception of stick forces which became very heavy at 300 m.p.h. I.A.S. Flight characteristics were commendable and the American pilots were impressed by the manoeuvrability of this twin-engined aircraft. The stall characteristics were satisfactory and the pilot was adequately warned of the approaching stall. The approach and landing characteristics were also found to be very good, the aircraft touching down at 70-75 m.p.h. On the debit side the American pilots noted: (1) the roughness of the engines; (2) the excessive noise and vibration levels in the cockpit at all speeds; (3) the narrowness of the cockpit and insufficient pilot's seat adjustment; (4) the visibility downward and to the rear which were respectively found poor and very poor.

When, on 15th June 1944, B-29s of the XX Bomber Command made their first attack on Japan they were intercepted by eight *Toryus* which later claimed to have shot down eight Superfortresses and probably three more. At that time, the J.A.A.F. had taken delivery of some forty Ki-45 KAIc and the production

Australian infantrymen examining a Toryu *found on Labun Island, off Borneo.*
(Photo: Australian War Memorial)

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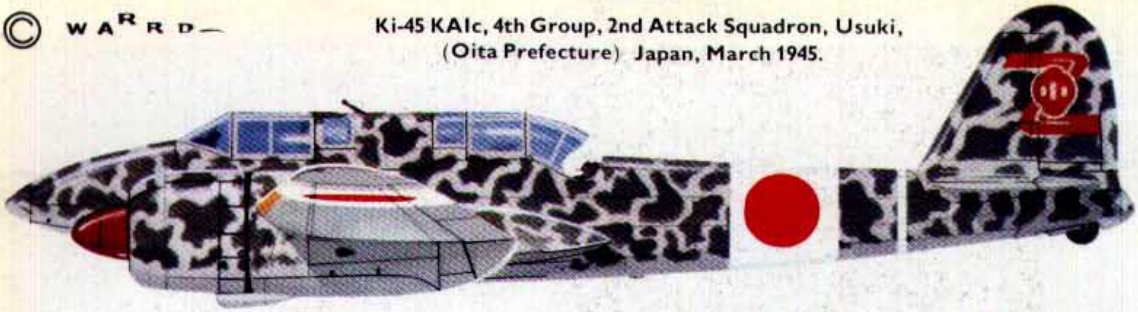
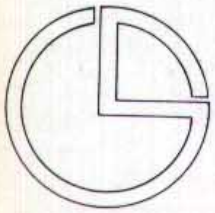
Ki-45 KAIc, 4th Group, 2nd Attack Squadron, Usuki, (Oita Prefecture) Japan, March 1945.



4th Grp., 2nd Sqdn.

Ki-45 KAIb, 5th Group, New Guinea, Spring 1944.



5th Grp., 1944.

Ki-45 KAIc, 25th Direct Command Squadron, Harbin, Manchuria, May 1944.

25th D.C. Sqdn., 1944-5.

Ki-45 KAIc, 5th Group, Kamachi, (Aichi Prefecture) Japan, 1944.

5th Grp., late 1944.

5th Grp., 1st Sqdn., Kashiwa (Chiba Prefecture) Japan Sept. 1942.

Ki-45 KAIc, 71st Direct Command Squadron, Singapore, August 1945.

Ki-45 KAIb, 21st Group, 1st Squadron, Palembang, Sumatra, Summer 1945.

5th Grp., 3rd Sqdn., New Guinea, Aug. 1943.

Ki-45 KAIa, 13th Group, 3rd Attack Squadron, Rabaul, June 1943.

16th Grp., 1st Sqdn., Central China, 1943.

A captured Ki-45 KAIc of the second production batch in the United States. (Photo: Australian War Memorial)

SPECIFICATIONS

	Ki-45 (2nd Proto)	Ki-45 (7th Proto)	Ki-45 KAIa	Ki-45 KAIc	Ki-45-II
Span	47 ft. 6⅞ in.	47 ft. 6⅞ in.	49 ft. 3⅝ in.	49 ft. 3⅝ in.	51 ft. 1 in.
Length	33 ft. 8½ in.	33 ft. 7½ in.	34 ft. 1⅞ in.	36 ft. 1⅞ in.	—
Height	11 ft. 8⅞ in.	11 ft. 8⅞ in.	12 ft. 1½ in.	12 ft. 1½ in.	—
Wing Area	312·15 sq. ft.	312·15 sq. ft.	344·44 sq. ft.	344·44 sq. ft.	364·25 sq. ft.
Empty Weight	5,512 lbs.	6,945 lbs.	8,146 lbs.	8,818 lbs.	—
Loaded Weight	8,267 lbs.	9,700 lbs.	11,632 lbs.	12,125 lbs.	—
Maximum Weight	9,321 lbs.	—	—	—	—
Wing Loading *	26·5 lbs./sq. ft.	31·1 lbs./sq. ft.	33·8 lbs./sq. ft.	35·2 lbs./sq. ft.	—
Power Loading *	5·7 lbs./h.p.	4·85 lbs./h.p.	5·8 lbs./h.p.	5·6 lbs./h.p.	—
Fuel Capacity:					
Internal	330 U.S. gals.	330 U.S. gals.	383 U.S. gals.	265 U.S. gals.	—
Droptanks	—	—	106 U.S. gals.	106 U.S. gals.	—
Engine	2×Ha-20b	2×Ha-25	2×Ha-25	2×Ha-102	2×Ha-112-II
Take-off Rating	730 h.p.	1,000 h.p.	1,000 h.p.	1,080 h.p.	1,500 h.p.
War Emergency Rating	820 h.p. at 12,800 ft.	1,050 h.p. at 8,370 ft.	1,050 h.p. at 8,370 ft.	1,050 h.p. at 9,185 ft.	—
Maximum Speed	298 m.p.h. at 13,125 ft.	323 m.p.h.	335·5 m.p.h. at 18,290 ft.	340 m.p.h. at 21,335 ft.	367 m.p.h. at 18,290 ft.
Cruise Speed	217 m.p.h. at 11,480 ft.	—	—	236 m.p.h.	—
Climbing Speed	15,240 ft. in 10 min. 12 sec.	—	15,240 ft. in 6 min. 17 sec.	15,240 ft. in 7 min.	—
Service Ceiling	—	—	—	30,480 ft.	—
Range: Normal	1,087 miles	—	—	1,243 miles	—
Armament: Fixed	2×7·7 mm. Type 89 1×20 mm. Ho-3	2×7·7 mm. Type 89 1×20 mm. Ho-3	2×12·7 mm. Type 1 1×20 mm. Ho-3	2×20 mm. Ho-5 1×37 mm. Ho-203	2×12·7 mm. Type 1 2×20 mm. Ho-5
Flexible	1×7·7 mm. Type 89	1×7·7 mm. Type 89	1×7·92 mm. Type 98	1×7·92 mm. Type 98	1×7·92 mm. Type 98

* *At normal loaded weight and take-off rating.*

Ki-45 ARMAMENT

	Nose	Ventral Tunnel (Starboard Side)	Dorsal Fixed (Obliquely Mounted)	Rear Firing Flexible
Ki-45 Prototypes	7·7 mm.×2 (Type 89)	20 mm.×1 (Ho-3) 100 rounds (2×50)	—	7·7 mm.×1 (Type 89)
Ki-45 KAIa	12·7 mm.×2 (Type 1)	20 mm.×1 (Ho-3) 100 rounds (2×50)	—	7·92 mm.×1 (Type 98) 1,050 rounds (14×75)
Ki-45 KAIa (exp. night fighter)	12·7 mm.×2 (Type 1)	20 mm.×1 (Ho-3) 100 rounds (2×50)	12·7 mm.×2 (Type 1) or 20 mm.×2 (Ho-5)	
Ki-45 KAIb	20 mm.×1 (Ho-3) 50 rounds	37 mm.×1 (Type 98) handloaded	—	7·92 mm.×1 (Type 98) 1,050 rounds (14×75)
Ki-45 KAIc	—	37 mm.×1 (Ho-203) 16 rounds	20 mm.×2 (Ho-5) 100 r.p.g.	7·92 mm.×1 (Type 98) * 1,050 rounds (14×75)
Ki-45 KAId	20 mm.×2 (Ho-5)	37 mm. ×1 (Ho-203) 16 rounds	—	7·92 mm.×1 (Type 98) * 1,050 rounds (14×75)
Ki-45 KAI	—	75 mm.×1	—	—
Ki-45 KAI	37 mm.×1	20 mm.×1 (Ho-3) 100 rounds (2×50)	20 mm.×2 (Ho-5) 100 r.p.g.	—
Ki-45 KAI	12·7 mm.×2 (Type 1)	—	20 mm.×2 (Ho-5) 100 r.p.g.	7·92 mm.×1 (Type 98) 1,050 rounds (14×75)
Ki-45 KAI	37 mm.×2	—	12·7 mm.×2 (Type 1)	—
Ki-45 KAI	37 mm.×1	—	20 mm.×2 (Ho-5) 100 r.p.g.	7·92 mm.×1 (Type 98) 1050 rounds (14×75)
Ki-45 KAI	37 mm.×1 (Ho-203)	20 mm.×1 (Ho-3)	20 mm.×2 (Ho-5)	—

Many other field modifications.

* *Not retained on late production aircraft.*

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